

MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2320
Gaithersburg, Maryland 20899-2320

SRM Number: 4967A
MSDS Number: 4967A
SRM Name: Radium-226 Radioactivity
Standard

Date of Issue: 17 March 2005

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Description: SRM 4967A consists of radioactive radium-226 chloride (and its radioactive decay products), non-radioactive barium chloride, and hydrochloric acid dissolved in 5 mL of distilled water contained in a flame-sealed NIST borosilicate-glass ampoule. The resulting solution is 1.0 M hydrochloric acid. The SRM is intended for the calibration of instruments and for the monitoring of radiochemical procedures.

Substance: Radium-226 Chloride and Barium Chloride in 1.0 M Hydrochloric Acid

Other Designations: **Radium-226 Chloride** and **Barium Chloride** (barium dichloride) in **Hydrochloric Acid** (aqueous hydrochloric acid; hydrogen chloride; muriatic acid).

SRM 4967A is a radioactive material with a massic activity of approximately 3 kBq g⁻¹. The hazard information supplied in this MSDS is for the Chemical Hazard Only! For the hazard documentation concerning the radioactive material, refer to the SRM certificate.

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component: Hydrochloric Acid
CAS Number: 7647-01-0
EC Number (EINECS): 231-595-7
SRM Nominal Concentration (mass %): 4
EC Classification: T, C
EC Risk (R): 23, 35
EC Safety (S): 1, 2, 9, 26, 336, 37, 39, 45

Component: Barium Chloride^(a)
CAS Number: 10361-37-2
EC Number (EINECS): 233-788-1
SRM Nominal Concentration (mass %): 0.008

^(a) The total concentration of BaCl₂ in this material is less than 1 % of the composition of the mixture which is below the reportable limit required by OSHA according to 29 CFR 1910.1200 (g)(2)(i)(C)(1) for MSDS information of a health hazard. BaCl₂ is not listed in the National Toxicology Program (NTP) Annual Report on Carcinogens nor has it been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs, or by OSHA.

3. HAZARDS IDENTIFICATION

Hydrochloric Acid		
NFPA Ratings (Scale 0–4):	Health = 3	Fire = 0 Reactivity = 0
Major Health Hazards:	Respiratory tract burns. Skin burns. Eye burns. Mucous membrane burns.	
Potential Health Effects		
Inhalation:	Inhalation of fumes may cause irritation and burning of the nose, throat, and upper respiratory tract, coughing and choking.	
Skin Contact:	Skin contact may cause severe irritation, inflammation, and chemical burns.	
Eye Contact:	Vapors are irritating and may cause damage to the eyes. Eye contact may cause severe irritation, conjunctivitis, corneal necrosis, and burns with impairment or permanent loss of vision.	
Ingestion:	Ingestion can cause pain and burns of the mouth, throat, esophagus, and stomach. May also cause nausea, vomiting, diarrhea, chills, shock, and intense thirst. Perforation of the intestinal tract and circulatory collapse may occur. Death may occur due to esophageal or gastric necrosis.	
Listed as a Carcinogen/ Potential Carcinogen:	Yes No	
	_____ <u> X </u>	In the National Toxicology Program (NTP) Report on Carcinogens.
	_____ <u> X </u>	In the International Agency for Research on Cancer (IARC) Monographs.
	_____ <u> X </u>	By the Occupational Safety and Health Administration (OSHA).

4. FIRST AID MEASURES

Hydrochloric Acid	
Skin Contact:	Rinse affected area with copious amounts of water for at least 15 minutes while removing contaminated clothing followed by washing the area with soap and water. Obtain medical assistance if necessary.
Eye Contact:	Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance immediately.
Inhalation:	If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing by qualified personnel. Get medical attention if necessary.
Ingestion:	If ingestion occurs, contact poison control center or physician immediately. DO NOT INDUCE VOMITING. Give large quantities of water or milk. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head lower than hips to prevent aspiration. If person is unconscious, turn head to side. Obtain immediate medical assistance.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards:	Hydrochloric acid is not considered a fire hazard. May react with metals or heat to release flammable hydrogen gas.
Extinguishing Media:	Use regular dry chemical, carbon dioxide, water, or regular foam. Neutralize with alkaline material
Fire Fighting:	DO NOT touch spilled material. Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Use extinguishing agents appropriate for surrounding fire. Do not get water directly on material. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products.
Flash Point (°C):	Not applicable.
Method Used:	Not applicable.
Autoignition Temp. (°C):	Not applicable.

Flammability Limits in Air**UPPER (Volume %):** Not applicable.**LOWER (Volume %):** Not applicable.

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: **DO NOT** touch spilled material. Notify safety personnel of spill. Spills should be handled according to radioactive spill procedures. In addition to the radioactive material, the material contains a strong acid and is corrosive.

Disposal: Refer to Section 13, "Disposal Considerations".

7. HANDLING AND STORAGE

Storage: Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances. Store in a well-ventilated area.

Safe Handling Precautions: See Section 8, "Exposure Controls and Personal Protection" and the Certificate for SRM 4967A.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: **Hydrochloric Acid**
OSHA (PEL): 7 mg/m³ (5 ppm) ceiling
ACGIH: 2 ppm ceiling
NIOSH: 7 mg/m³ (5 ppm) recommended ceiling
OES UK: 2 mg/m³ (1 ppm) TWA (gas) (mist)
OES UK: 8 mg/m³ (5 ppm) STEL (gas) (mist)

Ventilation: Use a local exhaust ventilation system. Ensure compliance with applicable exposure limits.

Eye Protection: Wear safety goggles. **DO NOT** wear contact lenses in the laboratory. An eye wash station should be readily available near areas of use.

Personal Protection: Wear appropriate protective clothing and disposable chemically resistant gloves to prevent skin exposure.

9. PHYSICAL AND CHEMICAL PROPERTIES

Component: **Hydrochloric Acid**

Appearance and Odor: Colorless, liquid. Pungent, irritating odor.

Relative Molecular Weight: 36.46 g/mol

Molecular Formula: HCl

Evaporation Rate
(for HCl solutions 0.02 N to 2 N): > 1 (ether = 1)

Density (1 M HCl): 1.0 g/cm³

Water Solubility: Soluble.

10. STABILITY AND REACTIVITY

Stability: X Stable Unstable

Stable under ordinary conditions of use and storage.

Conditions to Avoid: Avoid heat and combustible materials. May ignite or explode on contact with combustible materials.

Incompatible Materials: Hydrochloric acid is incompatible with cyanides, metals, amines, bases, metal carbide, oxidizing materials, acids, halo carbons, combustible materials, halogens, and metal salts.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Acid halides.

Hazardous Polymerization: _____ Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: X Inhalation X Skin X Ingestion

Toxicity Data: Man, Oral LD₅₀: 2 857 µg/kg
Woman, Oral LD₅₀: 420 µl/kg
Human, Inhalation LC₅₀: 1 300 ppm/30 min
Human, Inhalation LC₅₀: 3 000 ppm/5 min
Rat, Inhalation LC₅₀: 3 124 ppm/1 h
Investigated as a mutagen and reproductive inhibitor.

**Health Effects
(Acute and Chronic):** See Section 3: "Hazards Identification" for potential health effects.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data

Fish Toxicity: Fathead minnow (Pimephales promelas) LC₅₀ (mortality): 21 900 µg/L (96 h)
Invertebrate Toxicity: Water flea (Daphnia magna) EC₅₀ (immobilization): 560 µg/L (48 h)
Algal Toxicity: Green algae (Chlorella pyrenoidosa) EC₅₀ (population size reduction):
800 µg/L (1 600 weeks)
Phytotoxicity: Water-hyacinth (Eichhornia crassipes) (residue): 1 000 µg/L
(4 weeks to 48 weeks)

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose in accordance with all applicable federal, state, and local regulations for radioactive materials. Hydrochloric acid is subject to disposal regulations U.S. EPA 40 CFR 262, Hazardous Waste Number D002.

14. TRANSPORTATION INFORMATION

SRM 4967A: Radium-226 Radioactivity Standard (5 mL)
U.S. DOT and IATA: Radioactive Material, excepted package, limited quantity of material, UN2910, Hazard Class 7; Sub Risk: Hydrochloric Acid, Dangerous Good in excepted quantities (5 mL), Hazard Class 8

15. REGULATORY INFORMATION

U.S. Regulations: CERCLA Sections 102a/103 (40 CFR 302.4):
Hydrochloric Acid: RQ 5 000 lbs (liquid)
SARA Title III Section 302 (40 CFR 355.30):
Hydrochloric Acid: TPQ 500 lbs (gas)
SARA Title III Section 304 (40 CFR 355.40):
Hydrochloric Acid: RQ 5 000 lbs (gas)
SARA Title III Section 313 (40 CFR 372.65):
Hydrochloric Acid: except non-aerosol forms
OSHA Process Safety (29 CFR 1910.119):
Hydrochloric Acid: TQ 500 lbs (gas)
California Proposition 65: Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE: Yes.

CHRONIC: No.

FIRE: No.

REACTIVE: No.

SUDDEN RELEASE: No.

CANADIAN Regulations: WHMIS Classification: Not determined.

EUROPEAN Regulations: EC Classification:

T Toxic

C Corrosive

Danger/Hazard Symbol:

T Toxic

EC Risk and Safety Phrases:

R 23 Toxic by inhalation.

R 35 Causes severe burns.

S1/2 Keep locked up and out of reach of children.

S 9 Keep container in a well-ventilated place.

S 26 In case of contact with eyes rinse immediately with plenty of water and seek medical advice.

S 36/37/39 Wear suitable protective clothing, gloves, and eye/face protection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

National Inventory Status

U.S. Inventory (TSCA): Hydrochloric Acid: Listed on inventory.

TSCA 12 (b)

Export Notification: Not listed.

16. OTHER INFORMATION

Sources: MDL Information Systems, Inc., MSDS *Hydrochloric Acid* 18 March 2004.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.